Life After Implementing Your Road Data Model

Are you saying that we have to maintain this data?

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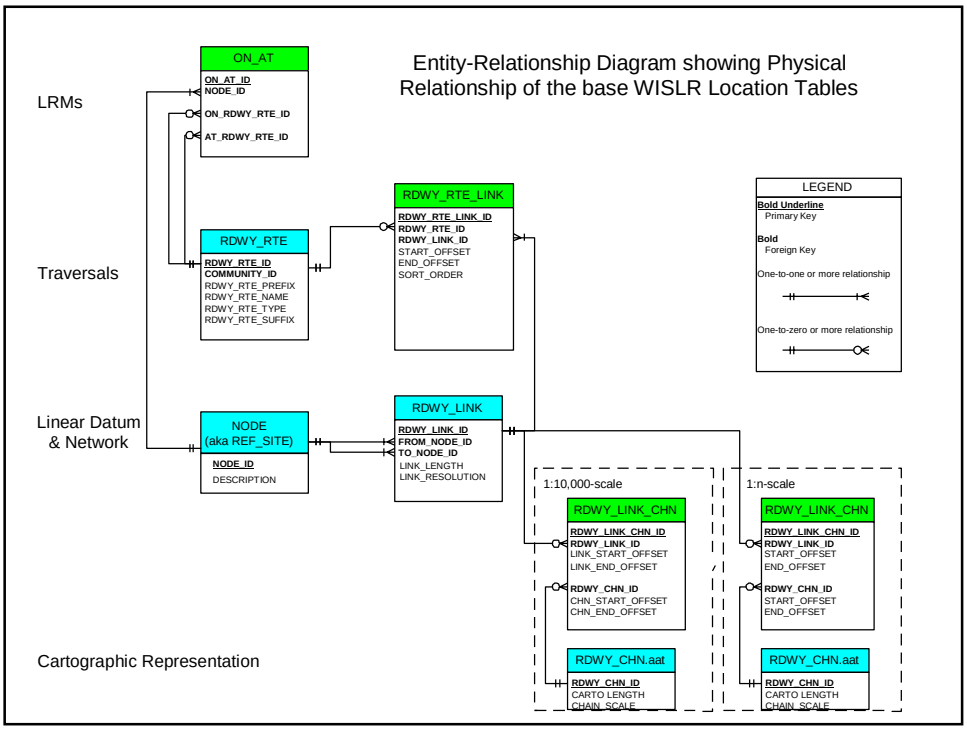
Introduction

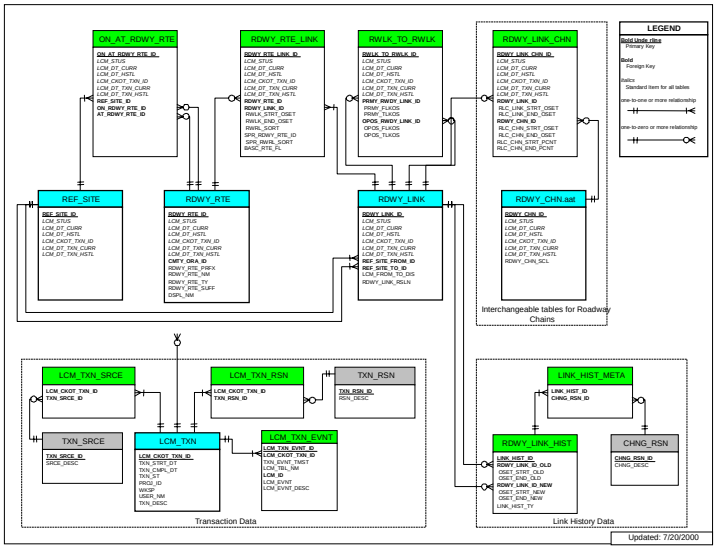
- Existing app to maintain STN LRS data
  - Approximately 15,000 miles of roadway
  - 7 year old application (Workstation Arc/Info, AML & coverages)
  - Timeliness of updates not a major concern
  - Only a couple of users editing LRS data
- Extending data to include all public roads
  - 110,000+ miles of roadway
  - Timeliness of updates a major issue
  - Up to a dozen users editing LRS data

Problem Statement

- More complex road data models require more complex interface to maintain data.
- Normalized data structures involve tables not easily understood by non-IT staff.
  - More so than non-spatial data maintenance apps
- Decentralized updates to LRS data involve more users editing at any one time.
  - More training required – more support
  - Breadth of knowledge among users varies



All LRS related data tables



Sample of Edit Functions - Old

Datum Edits

- Add Anchor Point
- Remove Anchor Point
- Add Anchor Section
- Remove Anchor Sect.

Cartography Edits

- Add Chain
- Remove Chain

Network Edits

- Add Node
- Remove Node
- Add Link
- Remove Link

Route Edits

- Add Road Name
- Remove Road Name

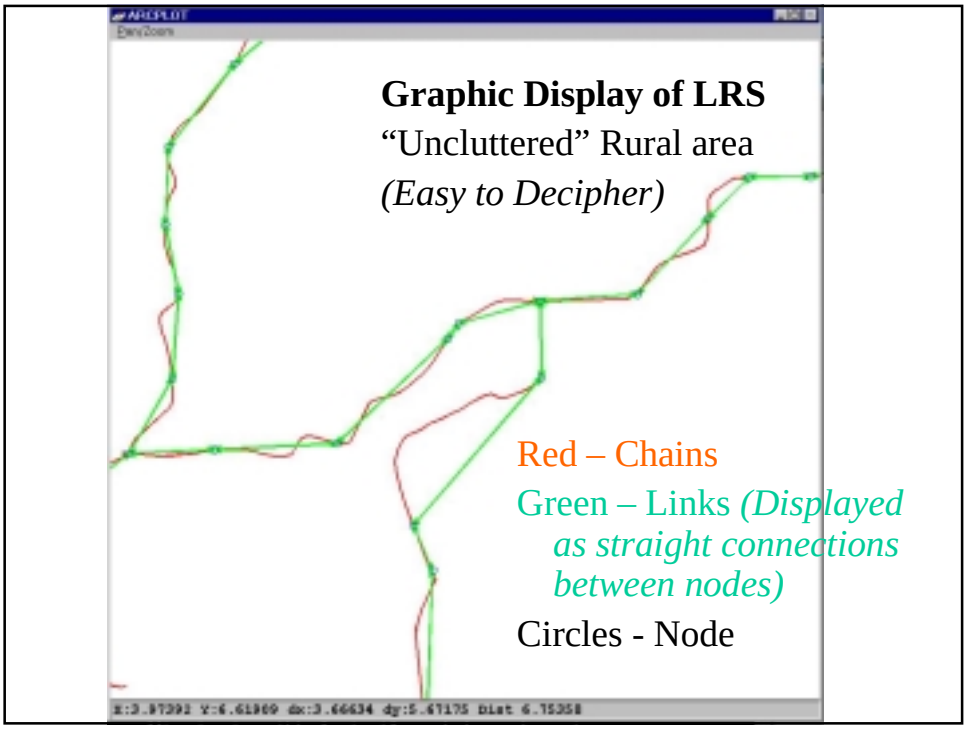
Sample of Edit Functions - Old

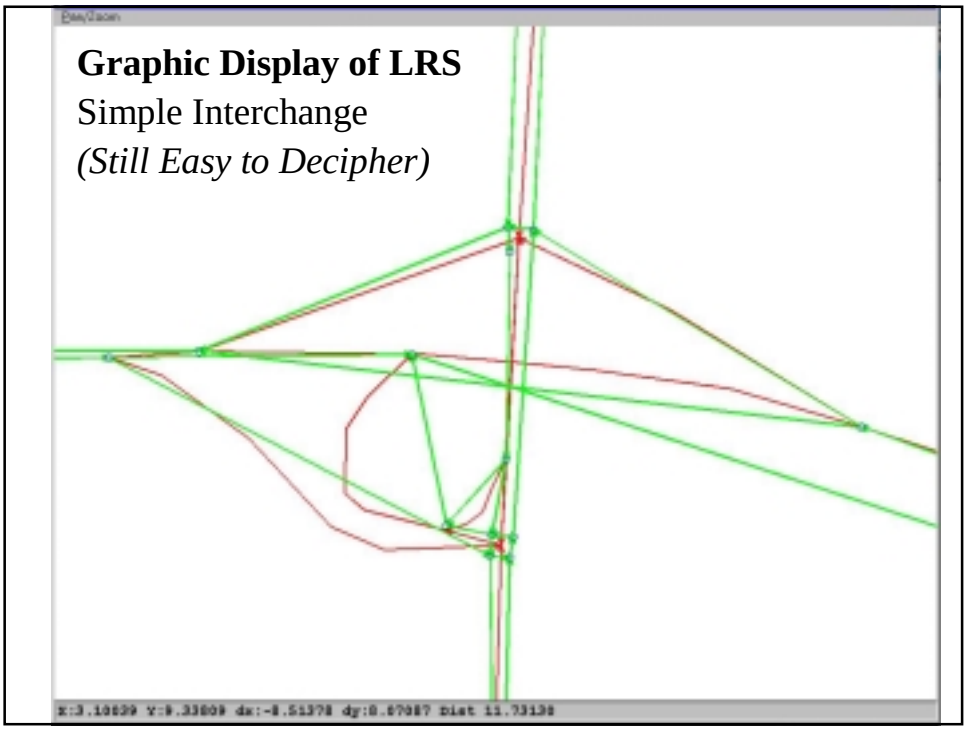
"Association Table" Edits – Edits to Associate the:

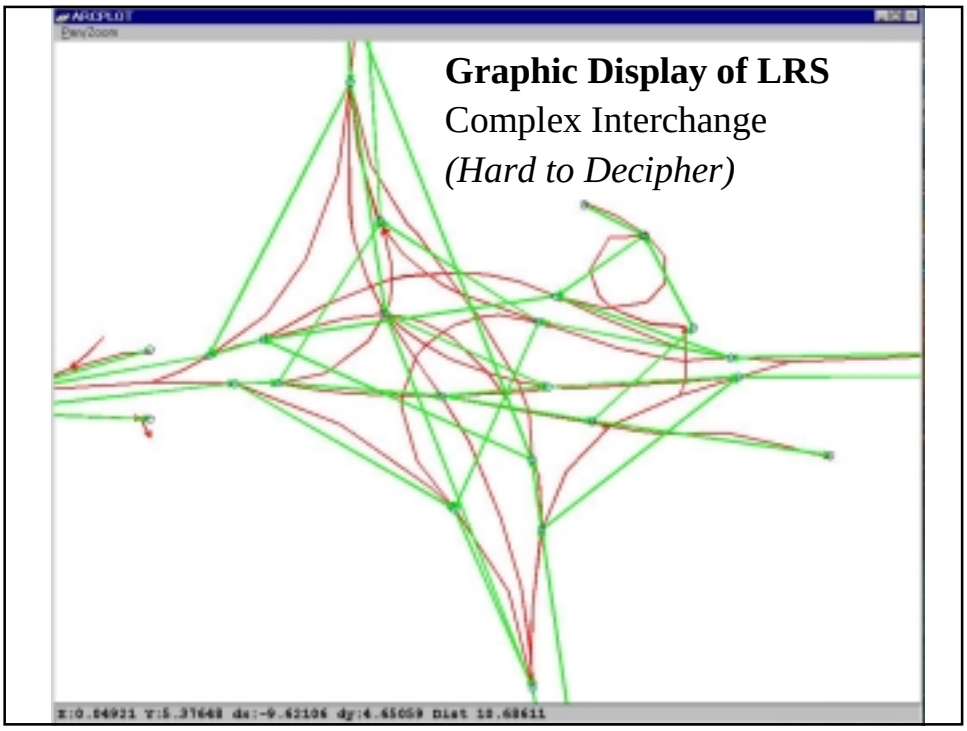
- Cartography to the Datum
- Network to the Datum
- Traversals to the Network
- Still valid portions of a retired Anchor Section to the corresponding portion of its replacement Section.
  - Allow automatic retying of business data where the roadway hasn't been altered but the Anchor Section representing it has been retired.

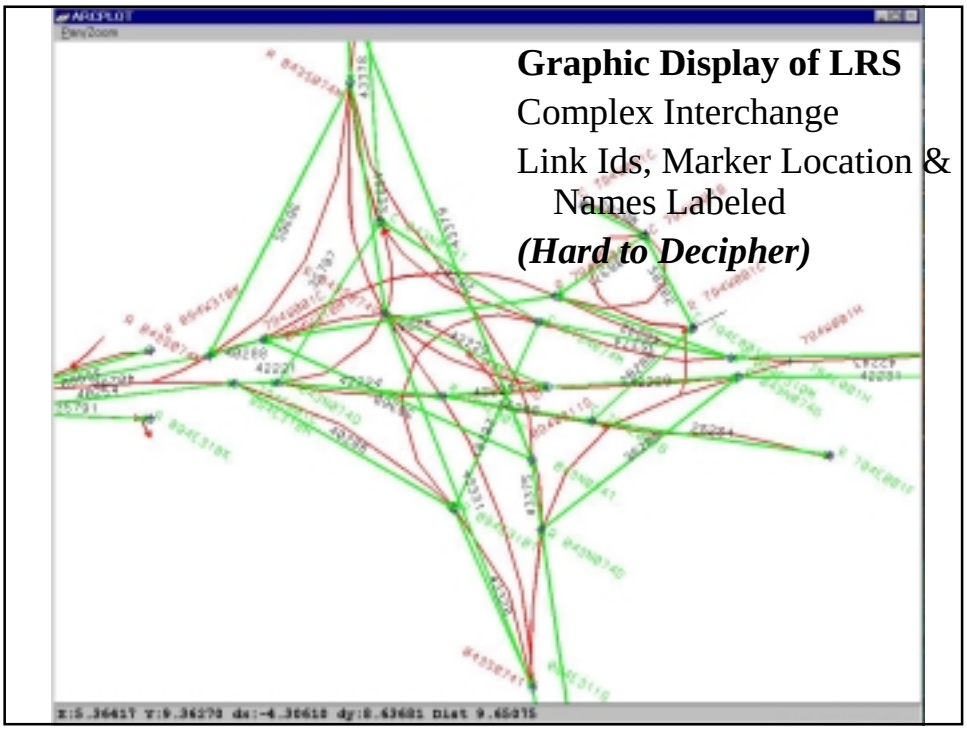
Edit Functions Issues - Old

- Edits work on the entity level.
  - Edits that can be performed on one database table at a time.
- User needs to know details of all tables.
  - What is a Traversal and how does it relate to a Link?
- Not very efficient to perform edits.
  - Ex.- Multiple edits required to add a road (Add A.S. & A.P., Add Nodes & Links, Add Traversals, etc.)
- ***However: Every scenario can be handled; Different users can be assigned different edit tasks (multiple LRMs & cartographies).***

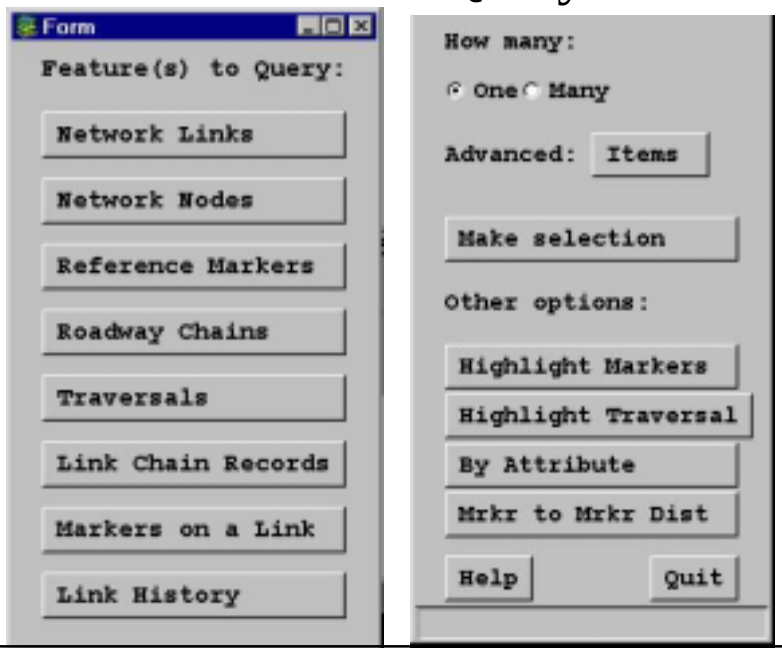

Graphic Display of LRS
"Uncluttered" Rural area
(Easy to Decipher)
Red – Chains
Green – Links (Displayed as straight connections between nodes)
Circles - Node

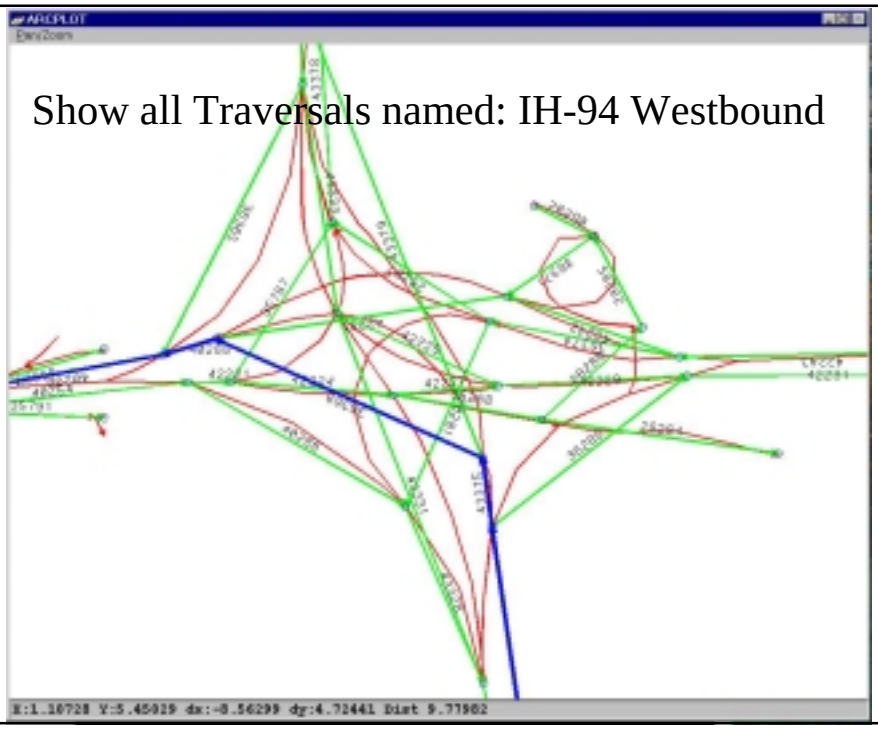

Graphic Display of LRS
Simple Interchange
(Still Easy to Decipher)


Graphic Display of LRS
Complex Interchange
(Hard to Decipher)

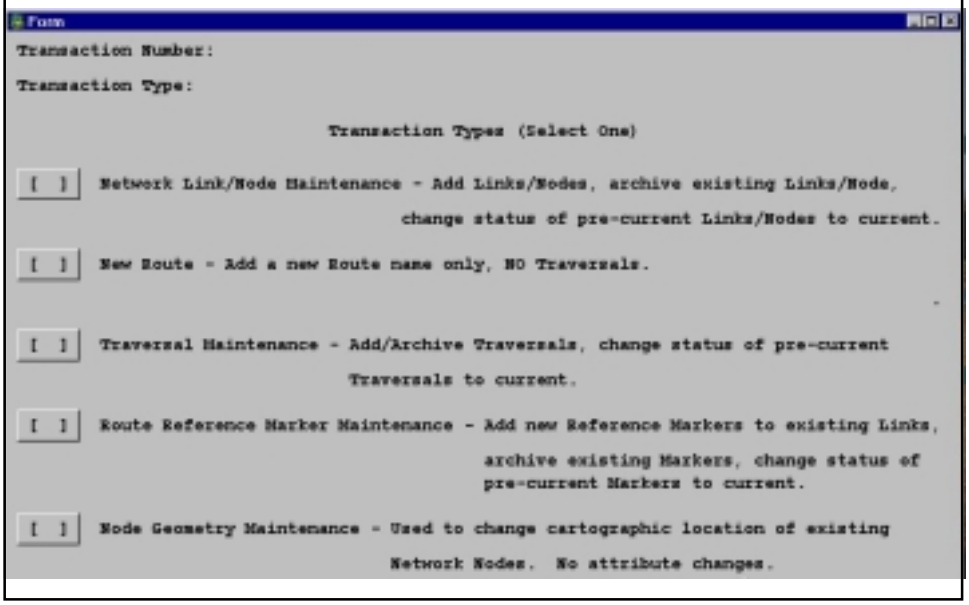

Graphic Display of LRS
Complex Interchange
Link Ids, Marker Location & Names Labeled
(Hard to Decipher)

Custom Menu to Query the Data

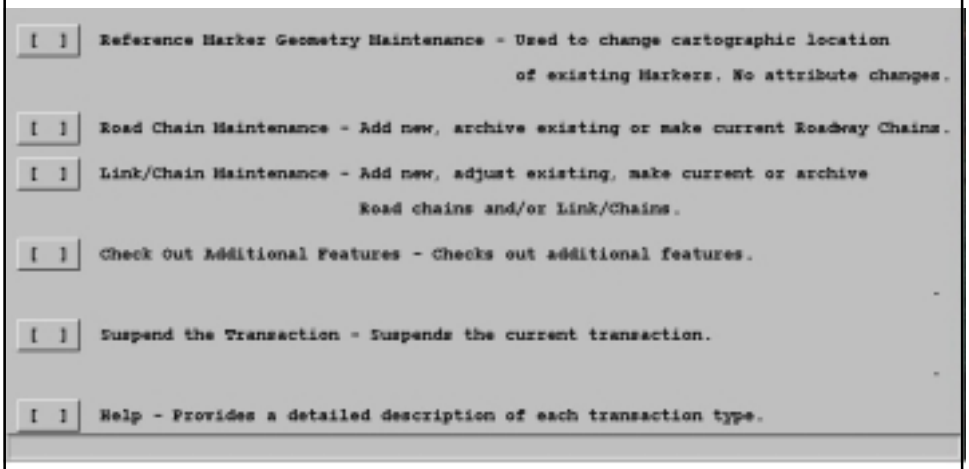




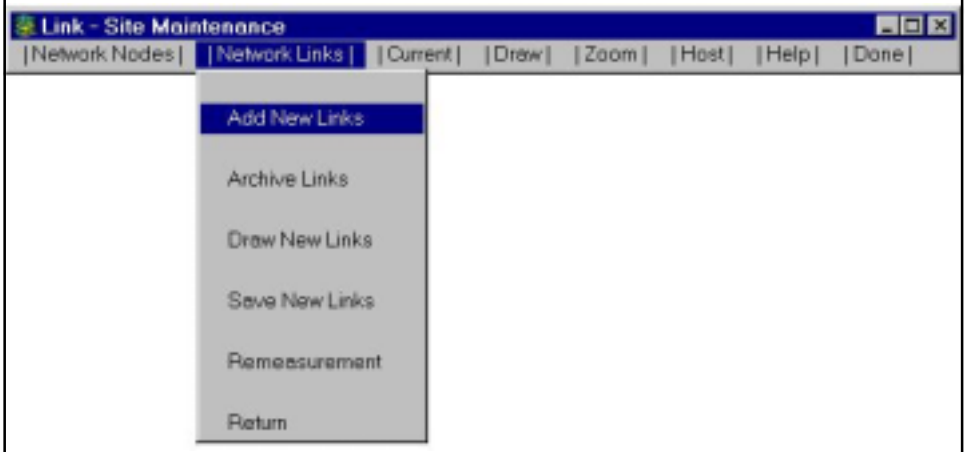
Edit Selection Menu – Top Half



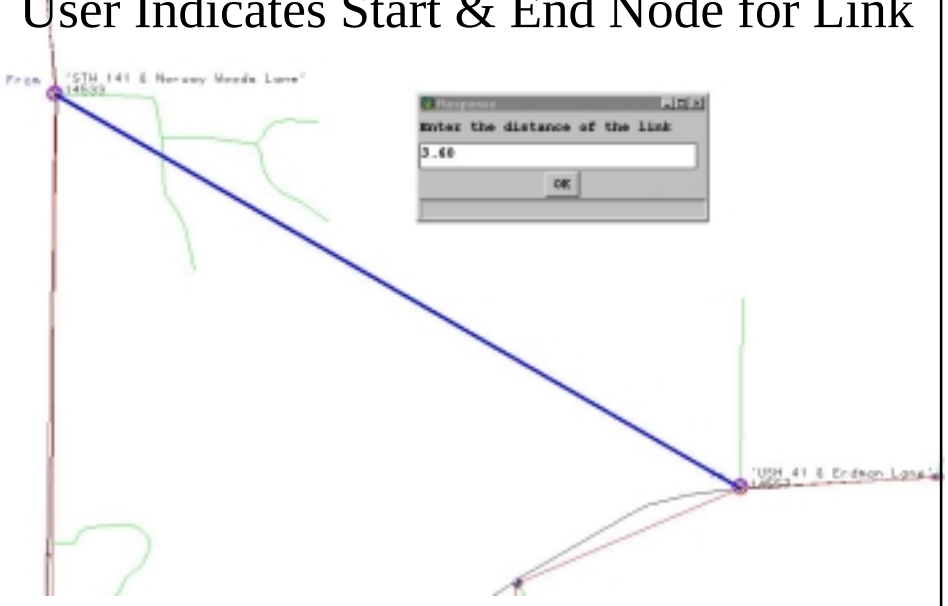
Edit Selection Menu – Bottom Half



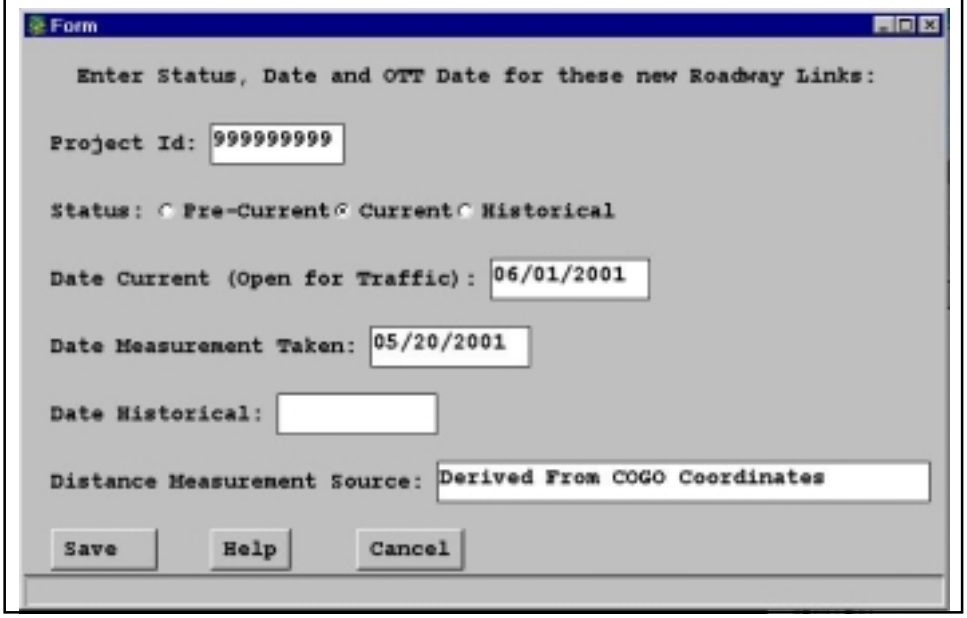
User Selects Edit to be Performed (Add a New Link)



User Indicates Start & End Node for Link



Additional Information to Add Link



Editing the LRS - Old

To complete the LRS for this road, the user still needs to add:

- Traversals
- LRMs (Reference Markers, Lightpoles, etc.)
- Cartography (Chains)
- Associations between tables
- ***All are performed as an individual edit (Can be very inefficient).***

Editing the LRS - Old

- Realization of inefficiencies of this approach.
- 1995 - Started to generate automatic reports listing related data that need edits.

  Edit Function: Retire Link

  Other Edits Needed: Retire Traversals, LRMs and potentially Nodes related that that Link
- 1997 – First "Higher-level" Edit tool

  Edit Function: Remeasure Link

  Edits Performed by Tool: Automatically retire Link, Traversals, LRMs, etc.; Automatically adds replacement Link, Traversals, LRMs, etc.

Editing the LRS - New

- Driven by real-world events.
  - A road was re-aligned
  - A road's name was changed…
- Accomplished by obtaining the necessary information to perform an edit.
  - **In a way that is more intuitive and efficient for the user.**
- New technology available for GIS development allows this approach to be taken.

Sample of Edit Functions - New

Datum & Carto Edits

- Add Road
- Remove Road
- Extend/Short Road
- Re-align Road
- Add Subdivision
- Remeasure Road (Datum edit only)
- New centerline source (Carto edit only)

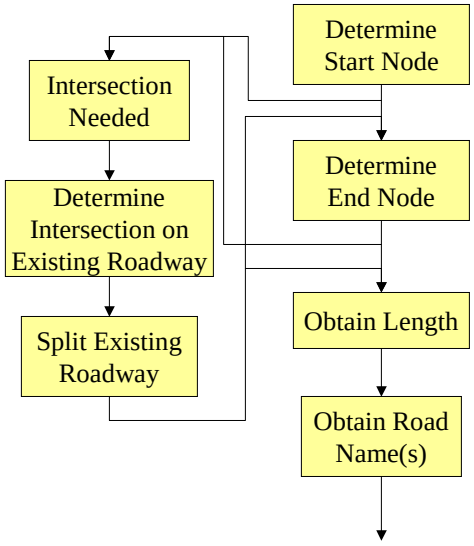
Network Edits

- Change Access Control
- Alter Traffic Flow (1-way to 2-way, etc.)

Traversal Edits

- Add Road Name
- Remove Road Name
- Shorten/Extend Rte Path
- Rename Road Name
- Alter Route Path

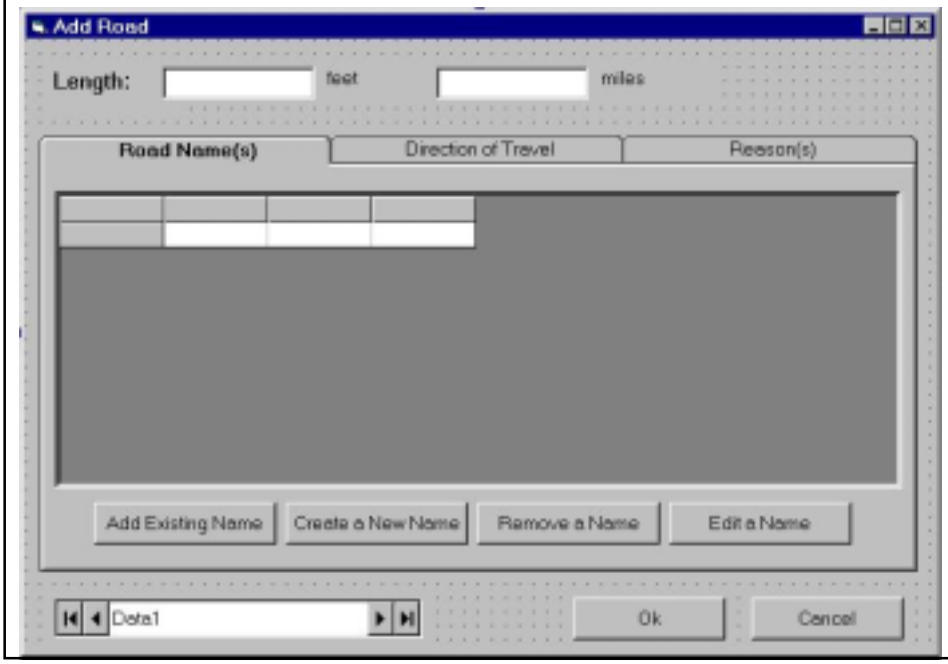
Portion of "Add Road" Process Flow



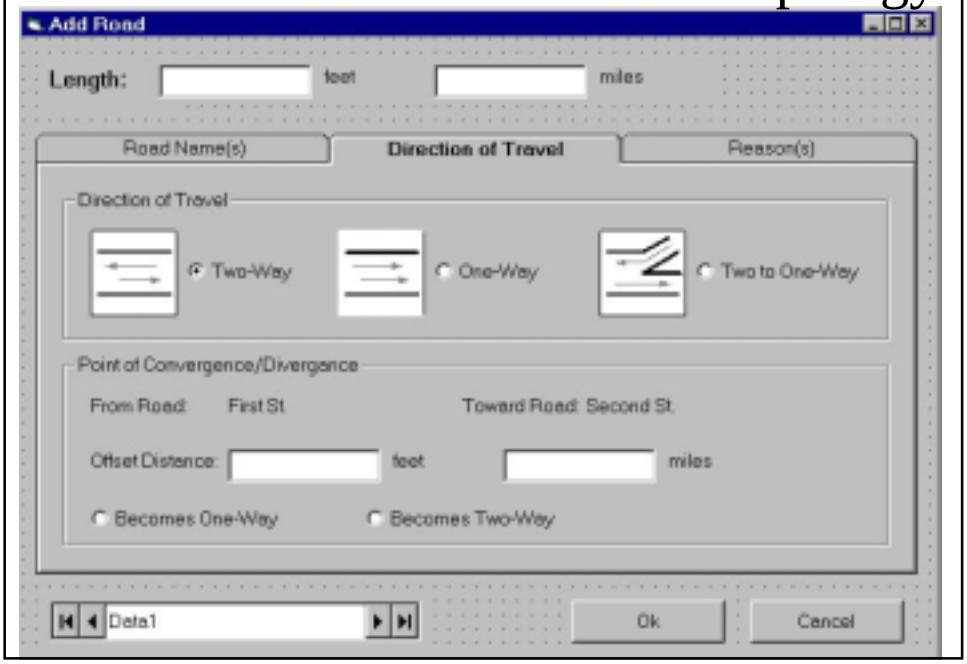
Editing the LRS - New

- Path through the flow chart determines which edit tools are called.
- Information obtained is the input to the edit tools.
- Edits performed to database only after all of the necessary information is completely obtained:
  - Increase of QA/QC, User has more time to think about commits.
- ***Still require programs that perform the basic edit functions (GUI is removed).***
  - ***Add Link, Remove Link, Add Traversal, etc.***
- ***More difficult to manage multiple LRMs & Carto.***

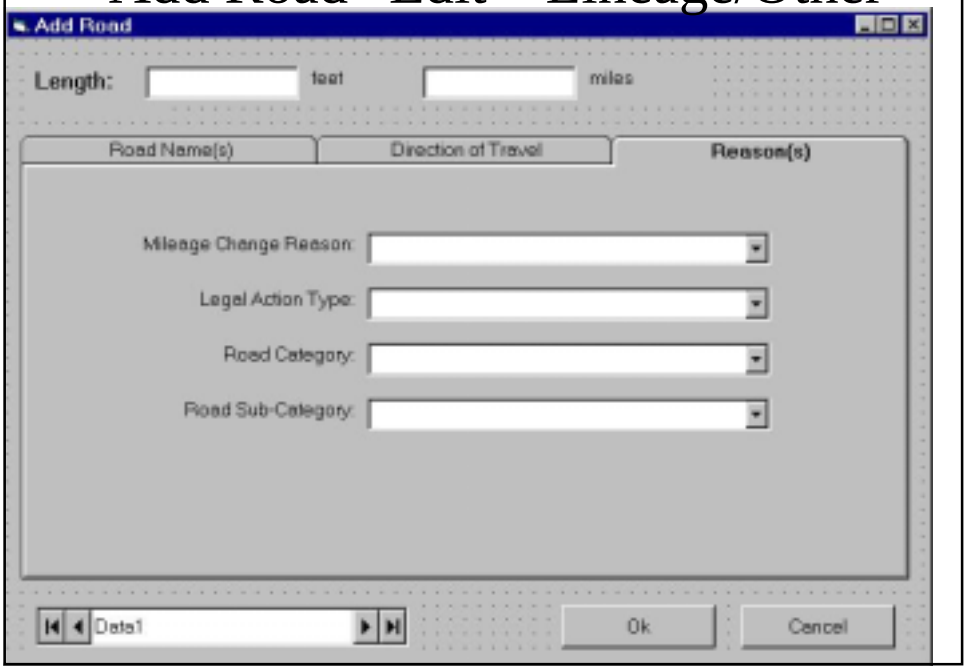
"Add Road" Edit – Road Names



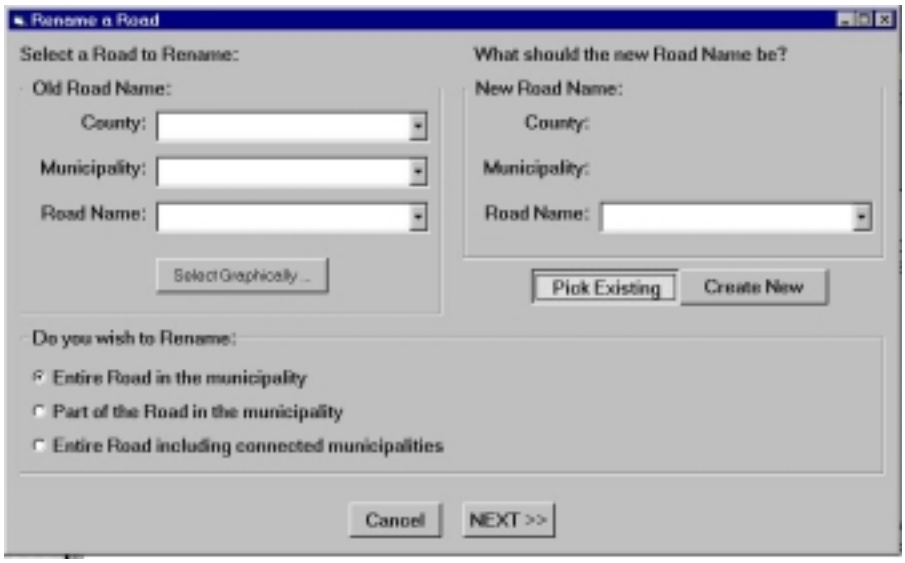
“Add Road” Edit – Network Topology



“Add Road” Edit – Lineage/Other



“Rename Road Name” Edit



Summary

- New technology (Hardware/Software/Database) allows this to happen.
  - What was once part of the application programming can now be embedded as part of the data model – Object/Relational.
  - An Object’s methods and behaviors.
  - Database triggers and constraints.
  - Fewer custom tools needed: Pan/Zoom, Named Extents, Query & Find tools
  - Similar look & feel to other “Commerical-Off-The-Shelf” software.

Summary

- Data and edits are presented to the user in a manner that is already familiar.
- Graphic display is less cluttered, making it easier to perform edits.
- Users aren't stupid, it is possible to "over-do" this approach.
  - Balance ease-of-use with level of productivity
  - Allow some flexibility in process flow
  - Establish a base-line minimum of LRS knowledge required by the user